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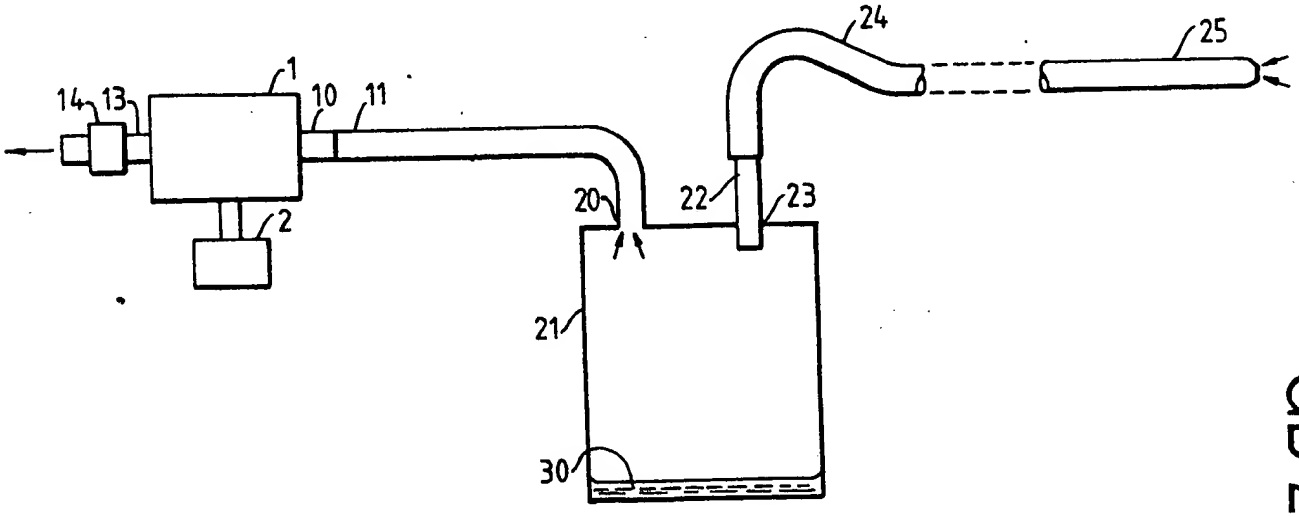
(54) Anti-foaming disinfectants used in surgical suction apparatus

(57) Medico-surgical suction apparatus has a collection vessel (21) into which is aspirated body fluid. The collection vessel contain an anti-foaming agent (30) that has disinfecting properties sufficient to disinfect its full contents. A typical anti-foaming agent comprises 59.99% of formaldehyde in a 38% concentration solution, 29.89% of gluteraldehyde in a 50% concentration solution, 9.295% of a silicone emulsion defoamer, 0.75% of a thickener and 0.075% of a colouring agent. This composition is effective at concentrations as low as 1.0% of the collection vessel volume.



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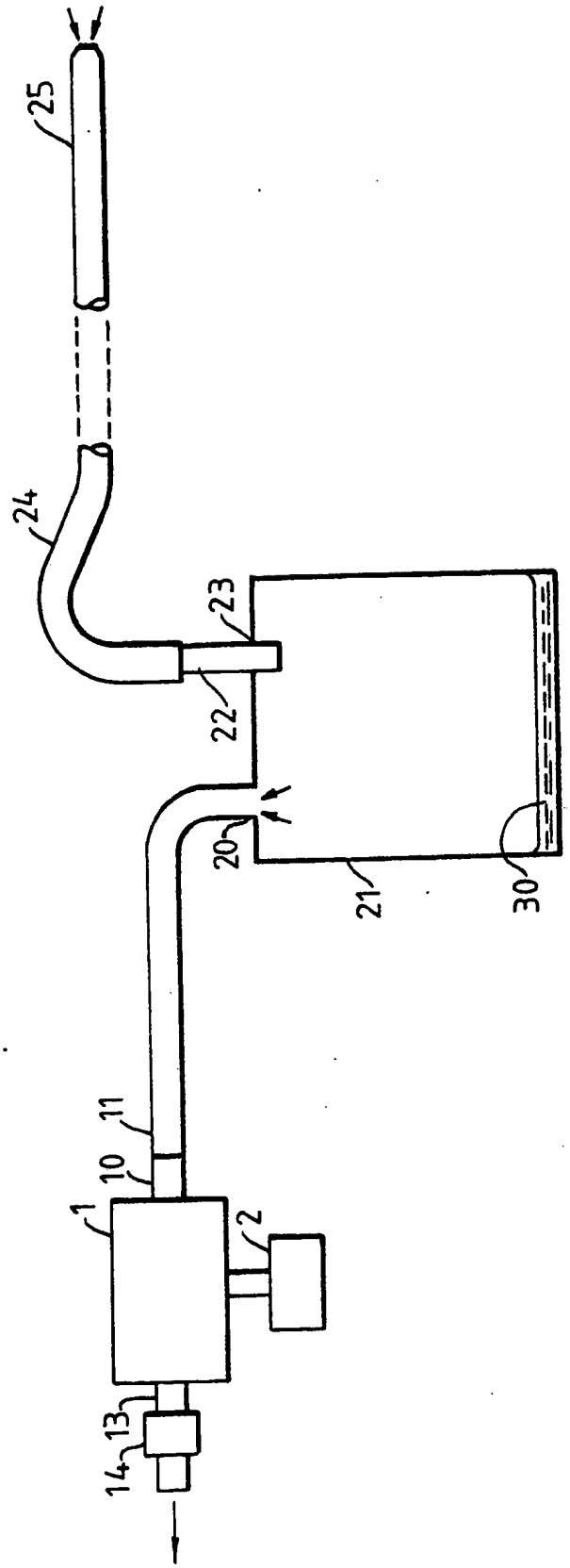

ANTI-FOAMING AGENTS, COLLECTION VESSELS AND SUCTION APPARATUS

This invention relates to anti-foaming agents and to collection vessels, and suction apparatus employing anti-foaming agents.

The invention is more particularly concerned with anti-foaming agents for use in medical or surgical suction apparatus.

Suction apparatus used in medicine or surgery commonly employs a vacuum pump having its inlet connected to a collection vessel which receives fluid from a suction catheter. The vacuum pump creates a reduced pressure in the collection vessel which sucks fluid along the catheter.

Such apparatus is used to remove blood, other body fluids and tissue debris from surgical wound sites and body cavities. As the fluid enters the collection vessel there may be a tendency for it to foam. Unless measures are taken to reduce the foam, it will rapidly fill the collection vessel and can be sucked into the vacuum pump leading to damage and to spread of infection. In addition, it can give a false indication of the volume of fluid collected; this is a disadvantage since knowledge of the fluid volume is clinically important.

Foaming within the collection vessel can be reduced by adding a known anti-foaming liquid, such as a silicone emulsion, to the collection vessel prior to use.

After use, the fluid in the collection vessel may contain high quantities

of pathogenic bacteria and viruses. Current methods of handing full collection vessels is hazardous and disposal of their contents carries a high risk of cross infection.

It is one object of the present invention to provide an anti-foaming agent that can be used to reduce this risk of cross-infection.

According to one aspect of the present invention there is provided an anti-foaming agent for use in the collection vessel of medico-surgical suction apparatus, wherein the agent has disinfecting properties sufficient to disinfect the full contents of the collection vessel.

The agent may be effective in quantities less than 7.5% of the volume of the collection vessel and is preferably effective in quantities about 1% of the volume. The agent may include formaldehyde and gluteraldehyde and preferably includes substantailly 60% of a substantially 38% concentration formaldehyde solution and substantially 30% of a substantially 50% concentration gluteraldehyde solution. The agent may include substantially 9% of an anti-foaming composition which may be a silicone emulsion defoamer. The agent preferably additionally includes a thickener and a colouring agent. The anti-foaming agent may comprise substantially 59.99% of formaldehyde in a 38% concentration solution, 29.89% of gluteraldehyde in a 50% concentration solution, 9.295% of a silicone emulsion defoamer, 0.75% of a thickener and 0.075% of a colouring agent.

Alternatively, the agent may contain a biocide containing a mixture of di(2-hydroxy ethoxy methane) in equilibrium with its precursors:

$C_5H_{12}O_4 = C_3H_8O_3$. The agent may contain substantially 83% by weight of the biocide.

According to another aspect of the present invention there is provided a collection vessel for containing fluid aspirated from a surgical wound site or body cavity, the vessel containing an anti-foaming agent in a small quantity compared with the volume of the vessel, the agent having disinfecting properties sufficient to disinfect the full contents of the collection vessel.

The agent may be present in a quantity less than 7.5% of the volume of the collection vessel and is preferably present in a quantity about 1% of the volume. The agent may include formaldehyde and gluteraldehyde and preferably includes substantially 60% of a substantially 38% concentration formaldehyde solution and substantially 30% of a substantially 50% concentration gluteraldehyde solution. The agent may include substantially 9% of an anti-foaming composition which may be a silicone emulsion defoamer. The agent preferably additionally includes a thickener. A part at least of the vessel is preferably transparent, the agent including a colouring agent. The agent may comprise substantially 59.99% of formaldehyde in a 38% concentration solution, 29.89% of gluteraldehyde in a 50% concentration solution, 9.295% of a silicone emulsion defoamer, 0.75% of a thickener and 0.075% of a colouring agent, a part at least of the vessel being transparent.

Alternatively, the agent may contain a biocide containing a mixture of di(2-hydroxy ethoxy methane) in equilibrium with its precursors: $C_5H_{12}O_4 = C_3H_8O_3$. The agent may contain substantially 83% by weight of the biocide.

It is another object to provide medico-surgical suction apparatus that can be used to reduce the dangers of handling collection vessels.

According to a further aspect of the present invention there is provided medico-surgical suction apparatus including a collection vessel according to the above other aspect of the present invention, means for applying a vacuum to the collection vessel, and a suction catheter connected with the collection vessel such that the vacuum causes fluid to be aspirated from the surgical wound site or body cavity via the suction catheter into the collection vessel and to be disinfected in the collection vessel on contact with the anti-foaming agent.

Medico-surgical suction apparatus including a collection vessel containing an anti-foaming agent, in accordance with the present invention, will now be described, by way of example, with reference to the accompanying drawing which shows the apparatus schematically.

The suction apparatus includes a vacuum pump 1 that is driven by an electric motor 2. The pump has an inlet 10 that is connected via a pipe 11 to an opening 20 at the top of a transparent collection vessel or bottle 21. An inlet tube 22 extends vertically through a second opening 23 into the collection bottle 21, the upper end being connected by flexible tubing 24 to a suction catheter 25. The collection bottle 21 is sealed, apart from the openings 20 and 23 communicating respectively with the pump 1 and the tubing 24. The outlet 13 of the pump 1 vents to atmosphere via a bacterial filter 14. The suction apparatus as so far described is entirely conventional.

The collection bottle 21 contains a small volume of a novel anti-foaming agent 30. The quantity of anti-foaming agent 30 needed will depend on the volume of collection bottle; typically, for a 2 litre bottle about 20 ml of the anti-foaming agent is required, that is, about 1.0%.

The anti-foaming agent is in liquid form comprising: 59.99% of formaldehyde in a 38% concentration solution; 29.89% of gluteraldehyde in a 50% concentration solution; 9.295% of a silicone emulsion anti-foaming composition such as Silcolapse 5000 made by ICI; 0.75% of a thickener such as Viscalex AT66; and 0.075% of a colouring agent such as a 0.1% solution of Loeffler's Methylene Blue.

This combination of formaldehyde and gluteraldehyde has been found to be particularly effective as a disinfectant, destroying the majority of micro-organisms, including bacteria and viruses, within a period of 1 minute when the anti-foaming agent is present at concentrations as low as 1.0% in the collection vessel. This disinfectant has also been found not to have any significant deleterious effect on the properties of the anti-foaming

composition or to be affected adversely by the anti-foaming composition.

The colouring agent serves to make the anti-foaming agent more identifiable in the collection bottle prior to aspiration which is a useful feature when the anti-foaming agent is only present in small quantities.

An alternative anti-foaming agent can be made of about 83% by weight of Phylatol, a biocide made by BDH Chemicals Limited and containing a mixture of di (2-hydroxy ethoxy methane) in equilibrium with its precursors: $C_5H_{12}O_4 = C_3H_8O_3$. The remainder of the anti-foaming agent comprises a silicone emulsion defoamer such as Silcolapse 5000 made by ICI, and a small quantity of a stabiliser, such as sodium carboxymethyl cellulose. The purpose of the stabiliser is to increase the viscosity of the blend so as to improve its stability. A coloured dye may also be added. This alternative anti-foaming agent has been found to be effective but to require greater quantities, typically 30ml would be required in a 2 litre bottle, that is 1.5%.

The criteria for selection of an anti-foaming agent with disinfecting properties are that it must be effective in small concentrations, typically less than about 7.5% of the collection vessel full volume. If an anti-foaming agent has to be used in large concentrations, this reduces the volume available for aspirated fluid thereby making it necessary to change the collection bottle more frequently or risk overflow. The anti-foaming agent must also effectively disinfect in the presence of blood. The term `disinfection' is defined in BS5283:1976.

An investigation of various disinfectants failed to reveal any other disinfectant that meets these criteria and remains compatible with the

defoaming agent. It will be appreciated, however, that the present invention is not restricted to the disinfectants referred to above but that other compositions capable of meeting the criteria may be used.

In use, the pump 1 creates a reduced pressure within the collection bottle 21, any fluid or tissue debris in the region of the patient end of the suction catheter 25 being sucked along the inlet tube 22 and into the collection bottle. As it enters the collection bottle 21, the aspirated fluid will mix with the anti-foaming agent 30 thereby dispersing it within the contents of the collection bottle. The majority of micro-organisms in the aspirated fluid are killed by the disinfecting properties of the agent 30, whilst foaming is inhibited by its anti-foaming properties. At the end of the procedure, the collection bottle 21 can be removed and the contents disposed of with a significantly reduced risk of cross-infection.

CLAIMS

1. An anti-foaming agent for use in the collection vessel of medico-surgical suction apparatus, wherein the agent has disinfecting properties sufficient to disinfect the full contents of the collection vessel.

2. An anti-foaming agent according to Claim 1, wherein the agent is effective in quantities less than 7.5% of the volume of the collection vessel.

3. An anti-foaming agent according to Claim 2, wherein the agent is effective in quantities about 1% of the volume of the collection vessel.

4. An anti-foaming agent according to any one of the preceding claims, wherein the agent includes formaldehyde and gluteraldehyde.

5. An anti-foaming agent according to any one of the preceding claims, wherein the agent includes substantially 60% of a substantially 38% concentration formaldehyde solution.

6. An anti-foaming agent according to any one of the preceding claims, wherein the agent includes substantally 30% of a substantially 50% concentration gluteraldehyde solution.

7. An anti-foaming agent according to any one of the preceding

claims, wherein the agent includes substantially 9% of an anti-foaming composition.

8. An anti-foaming agent according to Claim 7, wherein the anti-foaming composition is a silicone emulsion defoamer.

9. An anti-foaming agent according to any one of the preceding claims, wherein the agent additionally includes a thickener.

10. An anti-foaming agent according to any one of the preceding claims, wherein the agent includes a colouring agent.

11. An anti-foaming agent according to any one of the preceding claims comprising substantially 59.99% of formaldehyde in a 38% concentration solution, 29.89% of gluteraldehyde in a 50% concentration solution, 9.295% of a silicone emulsion defoamer, 0.75% of a thickener and 0.075% of a colouring agent.

12. An anti-foaming agent according to Claim 1 or 2, wherein the agent contains a biocide containing a mixture of di(2-hydroxy ethoxy methane) in equilibrium with its precursors:

$C_5H_{12}O_4 = C_3H_8O_3$.

13. Anti-foaming agent according to Claim 12, wherein the agent contains substantially 83% by weight of the said biocide.

14. An anti-foaming agent substantially as hereinbefore described with reference to the accompanying drawing.

15. A collection vessel for containing fluid aspirated from a surgical wound site or body cavity, wherein the vessel contains an anti-foaming agent in a small quantity compared with the volume of the vessel, and wherein the agent has disinfecting properties sufficient to disinfect the full contents of the collection vessel.

16. A collection vessel according to Claim 15, wherein the agent is present in a quantity less than 7.5% of the volume of the collection vessel.

17. A collection vessel according to Claim 16, wherein the agent is present in a quantity about 1% of the volume of the collection vessel.

18. A collection vessel according to any one of Claims 15 to 17, wherein the agent includes formaldehyde and gluteralehyde.

19. A collection vessel according to any one of Claims 15 to 18, wherein the agent includes substantially 60% of a substantially 38% concentration formaldehyde solution.

20. A collection vessel according to any one of Claims 15 to 19, wherein the agent includes substantially 30% of a substantially 50% concentration gluteraldehyde solution.

21. A collection vessel according to any one of Claims 15 to 20, wherein the agent includes substantially 9% of an anti-foaming composition.

22. A collection vessel according to Claim 21, wherein the anti-foaming composition is a silicone emulsion defoamer.

23. A collection vessel according to any one of Claims 15 to 22, wherein the agent additionally includes a thickener.

24. A collection vessel according to any one of Claims 15 to 23, wherein a part at least of the vessel is transparent, and wherein the agent includes a colouring agent.

25. A collection vessel according to any one of Claims 15 to 24, wherein the agent comprises substantially 59.99% of formaldehyde in a 38% concentration solution, 29.89% of gluteraldehyde in a 50% concentration solution, 9.295% of a silicone emulsion defoamer, 0.75% of a thickener and 0.075% of a colouring agent, and wherein a part at least of the vessel is transparent.

26. A collection vessel according to Claim 15 or 16, wherein the agent contains a biocide containing a mixture of di(2-hydroxy ethoxy methane) in equilibrium with its precursors:
$C_5H_{12}O_4 = C_3H_8O_3$.

27. A collection vessel according to Claim 26, wherein the agent contains substantially 83% by weight of the said biocide.

28. A collection vessel substantially as hereinbefore described with reference to the accompanying drawing.

29. Medico-surgical suction apparatus including a collection vessel according to any one of claims 15 to 28, means for applying a vacuum to the collection vessel, and a suction catheter connected with the collection vessel such that the vacuum causes fluid to be aspirated from the surgical wound site or body cavity via the suction catheter into the collection vessel and to be disinfected in the collection vessel on contact with the anti-foaming agent.

30. Medico-surgical suction apparatus substantially as hereinbefore described with reference to the accompanying drawing.

31. Any novel feature or combination of features as hereinbefore described.